MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM 2215)

DBM5014 – BUSINESS MATHEMATICS

(for diploma students only)

21 DECEMBER 2022
9.00 a.m – 11.00 a.m
(2 Hours)

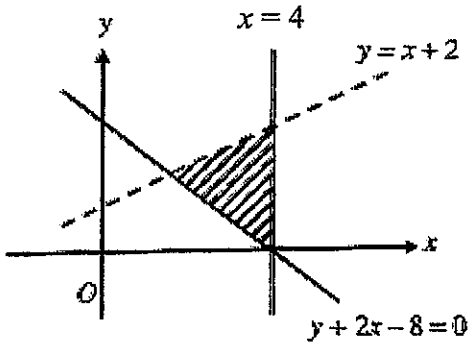
INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages including appendix.
2. Attempt **ALL** questions. The distribution of the marks for each question is given.
3. Please write all your answer in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

QUESTION 1

a) Write three inequalities which define the shaded region in diagram below.

(4 marks)



b) Agency 2Way operates a business selling two types of air purifier: "PeaceMind" and "ClearSecret". These air purifiers are installed by three-part timer agents, Nora, Halim, and Kelly. The time that each of the agents must spend on the installing is given in the following table:

	PeaceMind	ClearSecret
Nora	30 min	10 min
Halim	20 min	10 min
Kelly	50 min	10 min

Every week they can spend up to 300, 200 and 500 minutes, respectively, on the installation service. The company makes a profit of RM90 on each sale of PeaceMind and RM50 on each sale of ClearSecret.

i. Formulate the above information into a linear programming model.

(5 marks)

ii. What are the x and y intercepts for each of the constraints? (6 marks)

iii. Sketch the graph and shade the feasible region. (5 marks)

iv. Find the maximum profit by evaluating the corner points. (5 marks)

[TOTAL: 25 MARKS]

Continued...

QUESTION 2

a) Sally borrows RM50,000 from Bank A with simple interest of 3.1% per annum for 7 years. Meanwhile, Ryan borrows the same amount from Bank B with simple interest of 5% per annum for the same duration. State the difference of interest amount paid between both. (5 marks)

b) Samad receives simple interest of RM300 after saving RM1,540 for 5 years. Calculate the

i. interest rate. (2 marks)

ii. amount of simple interest he will receive if he saves RM450 for 4 years using the interest rate in (i). (2 marks)

iii. time in years required by Samad to earn simple interest of RM500 with a principal of RM8,000 and interest rate in (i). (2 marks)

c) Puan Rahmah has a loan of RM6,759 that is expected to be paid in 7 years. If the interest rate is 4.2% per year compounded every 3 months for 7 years. Find the present value. (5 marks)

d) Sara wants to invest in a business that guarantees a handful of cash flows within 3 years. Proposal A has an interest rate of 4% compounded quarterly, meanwhile Proposal B has an interest rate of 6% compounded semiannually. By comparing the effective rate, which Proposal provides better investment? (5 marks)

e) Mrs Sim wants to buy a house for the price of RM482,000. After she pays down payment of 10%, she will pay off the loan with equal monthly payment within 35 years loan tenure.

i. What is the loan amount Mrs Sim borrowed from the bank? (2 marks)

ii. Find the monthly instalment of the loan if the annual interest rate is 3% compounded monthly. (5 marks)

iii. Calculate the total interest that Mrs Sim needs to pay to the bank. (2 marks)

[TOTAL: 30 MARKS]

Continued...

QUESTION 3

a) Differentiate the following functions.

i. $f(x) = 10x^2 - 8lnx + x$ (3 marks)

ii. $y = \frac{2x^5+5x-2}{3x^2+5x+3}$ (7 marks)

b) Use Chain Rule to differentiate $y = \sqrt[3]{x^5 - 3}$ (5 marks)

c) The weekly total cost function associated with the manufacturing of printers is

$$C(x) = 0.000003x^3 - 0.04x^2 + 200x + 70000$$

i. Find the marginal cost function. (3 marks)

ii. What is the marginal cost if the quantity printer manufactured is 15000? (2 marks)

[TOTAL: 20 MARKS]

QUESTION 4

a) Evaluate the following integrals.

i. $\int_5^9 (6x^2 + 3x + 10)\, dx$ (7 marks)

ii. $\int_1^3 \frac{e^x}{3} + 2x\, dx$ (5 marks)

b) Given $\frac{dy}{dx} = \frac{9}{(2-7x)^2}$,

i. find y by using substitution rule. (5 marks)

ii. express y in terms of x when $x = 2$ and $y = -3$. (2 marks)

c) The marginal revenue of a product is $R'(x) = 200 - 2x$. Find the increase in revenue if the number of products increases from 50 units to 100 units. (6 marks)

[TOTAL: 25 MARKS]

End of Paper

APPENDIX – KEY FORMULA

Mathematics of Finance:

Simple Interest	***Compound Interest***
$I = Prn$	$FV = PV\left(1+\frac{r}{n}\right)^{nt}$
Present Value Annuities	***Future Values Annuities***
$A = R\left[\frac{1-\left(1+r/n\right)^{-nt}}{r/n}\right]$	$S = R\left[\frac{\left(1+r/n\right)^{nt}-1}{r/n}\right]$

Derivatives

Product Rule	***Quotient Rule***	***Chain Rule***
$\frac{d}{dx}[f(x)\cdot g(x)] = fg'+gf'$	$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{gf'-fg'}{g^2}$	$\frac{d}{dx}f[g(x)] = f'[g(x)]\cdot\frac{d}{dx}g(x)$
Logarithm Rule	***Properties of logarithm***	***Exponential Functions***
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$a\ln x = \ln x^a \qquad \ln e = 1$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$

Integration

$\int k\,dx = kx + C$	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq 1$
$\int e^x\,dx = e^x + C$	$\int \frac{1}{x}dx = \ln x + C$
Definite Integral $\int_a^b f'(x)dx = f(b) - f(a)$	